

Steep Cut Slope Composting: Field Trials and Evaluation

by

Robert Ament
Road Ecology Program Manager
Western Transportation Institute
College of Engineering
Montana State University – Bozeman

and

Stuart Jennings
Reclamation Research Group
Bozeman, MT

Quarterly Progress Report
MDT Project #8196
27 October 2008 thru 31 December 2008
prepared for the

Montana Department of Transportation
P.O. Box 201001
Helena, MT 59620-1001

February 17, 2009

TABLE OF CONTENTS

List of Tables	ii
List of Figures	iii
Introduction.....	1
Research.....	2
Task A: Kickoff Meeting:.....	2
Task B: Test Site Selection and Location	2
Task C: Test Plot Construction	3
Conclusions.....	4
Expenses	5
Task Completion.....	6
Appendix A: Kickoff Meeting Minutes	7

LIST OF TABLES

Table 1: Experimental design for compost research plots on MT Hwy. 84.	3
Table 2 : Expenses accrued by project as of 31 December 2008.....	5
Table 3: Task accomplishments in 2008.....	6

LIST OF FIGURES

Figure 1. Roadside overview of research site location along Montana Highway 84	3
--	---

INTRODUCTION

This quarterly progress report is submitted to the Montana Department of Transportation (MDT) for the Steep Cut Slope Composting: Field Trials and Evaluation project. It includes reporting for the first three tasks (A-C) in the research proposal: kickoff meeting (Task A), test site selection and location (Task B), and test plot construction (Task C). This quarterly progress report will not include a narrative of the test plot construction as this is a separate document that is being prepared for MDT. Lastly, it includes a section on expenditures for the project and summarizes accomplishments by task.

This research project has two primary objectives:

- evaluate compost performance using surface applied rates between 0.32 centimeters (cm) (0.125 inches) and 1.27 cm (0.5 in.). This phase of the research will establish minimum quantity recommendations to be used on steep cut slopes based on vegetation performance and erosion control, and
- assess the effectiveness of various tackifiers, erosion control fabric and netting in retarding wind and water erosion of compost on steep slopes.

To accomplish these objectives, the first three tasks were designed to:

- review and adjust, as needed, the project's goals, objectives and work plan via a kickoff meeting attended by the co-principal investigators, MDT staff and the Technical Panel (Task A),
- conduct reconnaissance of the proposed test site along Highway 84 twenty-five kilometers (15 miles) west of Bozeman to assure its utility for constructing the various test plots (Task B), and
- prepare the site and implement the experimental treatments before winter weather (Task C).

This project is a companion project to earlier work performed by Montana State University (MSU RRU 2007) evaluating compost application and incorporation on steep cut slopes for MDT. The earlier work evaluated compost application at rates of 2.5 cm (1 in.) and 5 cm (2 in.). It also evaluated the relative effectiveness of surface applied compost blankets versus compost incorporated into the surface soil. Test plots were built in northwest Montana on glacial till and in southeast Montana on marine shale parent material.

RESEARCH

Task A: Kickoff Meeting:

The MDT Technical Panel, Research Project Manager and the MDT Reclamation Specialist attended the kickoff meeting with the co-principal investigators (co-PIs) via a telecom conference on 21 October 2008 (see minutes, Appendix A). An overview of the project and the results of the phase I study were presented. Attendees of the meeting reviewed the draft proposal developed by the co-PIs and its experimental design based on MDT's Statement of Work and Request for Proposal. At the meeting, there were comments made, modifications requested and clarifications needed that necessitated changes to the proposal. After the meeting, the changes were incorporated into a final proposal by the co-PIs and approved by MDT.

After the kickoff meeting, changes to the budget were required to expedite the project so that it could be completed before winter weather would make it impossible to construct the test plots. The changes did not increase the budget's total amount, but rather reduced the amount in the line item for Reclamation Research Group and added a line item for a test plot construction contractor that would be paid by the Western Transportation Institute at Montana State University (WTI). The budget, as amended, was approved by MDT on 7 November 2008.

Task B: Test Site Selection and Location

A test site was located approximately 25 kilometers (15 miles) west of Bozeman on Montana Highway 84 (see Figure 1). This lane widening road project was completed in 2002. Steep slopes were cut into tertiary-age sedimentary parent material. Slopes did not receive a topsoil application before seeding during post-construction reclamation. In 2008 these slopes were nearly devoid of vegetation, approximately 1-5 % of the test site had vegetative cover.

In this location, Highway 84 is aligned on an east-west axis providing the opportunity for the establishment of test plots on both north-facing and south-facing slopes. The cut slopes where test plots were to be constructed are between 64 and 71 percent slope in steepness. Slope length is approximately 12.2-18.3 meters (40-60 feet). It was determined that the 22 test plots required by the project could be constructed in this location with spacing of at least 1.5 meters (5 feet) between each of the plots.

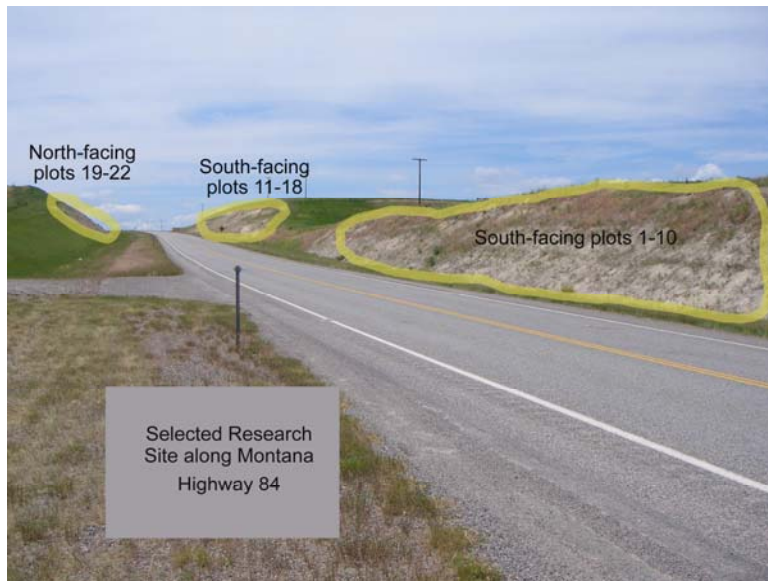


Figure 1. Roadside overview of research site location along Montana Highway 84

Task C: Test Plot Construction

Based on the experimental design for this research project (Table 1), twenty-two plots were laid out at the research site and plot construction occurred on 11-14 November 2008. Four plots were located on the north-facing slope and eighteen were located on south-facing slopes (Figure 1).

Table 1: Experimental design for compost research plots on MT Hwy. 84.

Treatment	Equipment		Aspect	Number of Plots				Total
	Blower Truck	Hydromulch Truck		Compost Application Rate				
				0	1/8 " (0.32 cm)	1/4 " (0.64 cm)	1/2" (1.3 cm)	
Control	No	No	South	2	0	0	0	2
Control	No	No	North	1	0	0	0	1
Compost blanket	Yes	No	South	0	2	2	2	6
Compost blanket	Yes	No	North	0	1	1	1	3
Compost blanket plus tackifier A (guar based)	Yes	Yes	South	0	0	0	2	2
Compost blanket plus tackifier B (dirt glue)	Yes	Yes	South	0	0	0	2	2
Compost blanket plus tackifier C (synthetic)	Yes	Yes	South	0	0	0	2	2
Compost blanket plus erosion control fabric	Yes	No	South	0	0	0	2	2
Compost blanket plus netting	Yes	No	South	0	0	0	2	2
Total Number of Plots				3	3	3	13	22

A full report of the plot construction is being written per the contract deliverables schedule. A draft will be circulated to the technical panel for their review in January.

CONCLUSIONS

Tasks A through C have now been completed. Research plots were constructed adjacent to Montana Highway 84 on steep, erosive cut slopes during the week of 10 November 2008. Twenty-two test plots were constructed with only one adjustment made to the experimental design, a plant-based tackifier was substituted for the synthetic tackifier. Experimental treatments evaluate varying depths of compost from 0-1.27 cm (0-0.5 inches) and the effect of aspect, north-facing versus south-facing slopes. Additional test plots were implemented to evaluate the relative effectiveness of five different techniques to retain compost blankets on steep slopes against wind and water erosion. Three tackifiers, an erosion control blanket and compost retention netting were used to stabilize 1.27 cm (0.5 inch) compost blankets on south-facing slopes. Test plots will be monitored for vegetation condition and erosion control during the 2009 and 2010 growing seasons.

EXPENSES

A report of expenses accrued by the project as of 31 December 2008 is given below in Table 5.

Table 2 : Expenses accrued by project as of 31 December 2008.

Expenses	Oct-Nov 2008
Salaries	4278.57
Benefits	1435.10
Travel	93.60
Contract Services	19,675.00
Equipment	196.75
Sub-contracts	6,484.79
Indirect Costs	<u>2,458.43</u>
Total Costs	34,425.49
 Total Budget	 90,480.00

TASK COMPLETION

A summary of each task and the progress that has been made since the inception of the project towards its completion is given below in Table 6.

Table 3: Task accomplishments in 2008.

Task	Completion Rate									
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
Task A: Kickoff Meeting										
Task B: Test Site Selection and Location										
Task C: Test Plot Construction										
Task D: Data Collection and Analyses										
Task E: Reporting										

APPENDIX A: KICKOFF MEETING MINUTES

Cut Slope Composting:
Field Trials and Evaluation
Kick Off Meeting via Conference Call
Tuesday, October 21, 2008
Minutes

Attending: Sue Sillick, Phil Johnson, Lisa Larsen, Patrick Plantenberg, Stuart Jennings, Pam Blicher and Rob Ament

Project Manager: Sue Sillick, MDT

Principal Investigator: Rob Ament, WTI

Technical Panel Chair: Phil Johnson, MDT

Technical Panel Members:

Boggs, Sandra

Burkhardt, Bob

Christensen, Kris

James, Carl

Johnson, Phil

Kaufman, Gene

Larsen, Lisa

Plantenberg, Patrick

Pokorny, Monica

Sillick, Sue

Technical subcontractors: Stuart Jennings and Pam Blicher, Reclamation Research Group (RRG)

Compost applications subcontractor: Quality Landscape Seeding (Quality)

Item 1- Process: Sue S. introduced the project and how it progressed to this point and discussed where we go from here. She indicated that Phil J. submitted a research problem statement. A scope of work (SOW) was developed and an RFP was issued. No proposals resulted from the RFP. In the meantime, WTI expressed an interest in the project. Sue approached WTI about working with RRG to conduct the research. WTI submitted a proposal and it was approved last week by the MDT Research Review Committee (RRC). She indicated the purpose of this kick-off meeting was to make sure we were all on the same page and ready to proceed with research.

Sue stressed that this technical panel is the key to project success. First, the panel developed a SOW and RFP that accurately reflected the desired project. Second, the panel needed to make sure the proposal accurately reflected the SOW, as the proposal is a part of the contract. Now that the project is active, the panel needs to review all products carefully to make sure they are getting what they want. Sue stated that project progress reports should be detailed enough that they could essentially be combined to form a final report. That way there should be no surprises when the draft final report is delivered.

Sue also stated it is her job, as project manager, to facilitate the panel getting what it wants out of the project and to act as a liaison between the panel and researchers. All decisions are made by the entire technical panel when meeting as a panel or through Sue via e-mail.

Sue stressed the importance of communication.

Item 2: Sue S. reviewed the contract and stressed that Rob should familiarize himself with the contractual requirements. Technical discussions are permitted as necessary between any panel member and the consultants. However, any decisions affecting scope, time, and budget must be approved by the entire panel and must go through Sue. Any proposed change in key project personnel must be approved by MDT prior to any changes being made. Also, any other contractual changes, including changes in budget category amounts need to be made prior to any changes being made. No data may be released while the project is active unless prior approval is obtained. The contract is a cost-reimbursement, not-to-exceed the contract amount. MDT withholds the last 15% until all products are accepted by MDT. The deliverables are outlined in the proposal and are considered draft until MDT accepts them. They should be the contractor's vision of the final polished products. The contract describes the roles of the individuals as noted above. WTI is contractually responsible for project, not RRG.

Item 3: Good communications are necessary for a successful project. Communications concerning the deliverables will be routed from Rob A. to Sue S. Sue S. will distribute to the technical panel. Issues on technical matters will be sent from Rob A. to Phil J. and Sue. Phil and Sue will send to the technical panel as appropriate. Stuart J. and Phil J. will communicate directly on smaller matters regarding details of implementing the project.

Item 4: The frequency of conference calls was discussed. It was decided that a conference call will occur after the following two deliverables are received by MDT:

- a. Test plot construction report
- b. 2009 field season report

Item 5: Stuart J. gave a short history of the Phase I study and how it shaped the objectives in the current project.

Item 6: Stuart J. gave an overview of the proposed experimental design (see Table 1.) which led to further refinements and a series of discussions regarding the various treatments (see items 7-10).

Item 7: A discussion of whether to retain the treatment using netting was pursued. It was resolved that it was worthwhile to include in the plot design given it may prove to be a cost-effective stabilization method. Therefore, the report on this treatment will detail costs and the ease (or difficulty) with which netting can be applied over the compost blanket.

Item 8: Due to the technical difficulties with applying gravel as a compost retention technique, this treatment was dropped from Table 1. In its place a second tackifier will be added to the treatment design. There are a wide variety of tackifiers, so Stuart J., Phil J. and Quality will discuss and then decide on which 2 tackifiers to use in the field tests that will most useful for MDT.

Item 9: A broad discussion of compost ensued as a result of its variety, quality, and the various quantities (application rates) that were described in Table 1. It was resolved that the specifications Phil J. has developed for MDT reclamation projects for wood compost and microblend compost will be used for application at the project site. This will ensure quality control and narrow the selection to two varieties of compost. It was noted that the chemistry/composition of these two composts should be described in the report.

Item 10. Application rates for the compost blankets in Table 1 are 1/8, 1/4, and 1/2 inch in depth. It was decided that it was more useful to use volume than weight or thickness. Phil J. remarked that 3 Tons/Acre was roughly equal to the 1/8 inch depth. So Quality will be applying compost blankets on the plots using 3, 6, or 9 Tons/Acre rates, which will be reported as volume as appropriate.

Item 11. It was decided that there would be minimal seed bed preparation for the project. The cut slope construction ended five years ago, but Stuart J. and Pam B. went to the site on Friday,

October 17th to review its condition. After some discussion, the following seed bed preparation will occur by MDT and others at the site on the first day, as Quality sets up their equipment:

- a. Hand raking of the few deep rills that occur within the plots will be done, as needed, to assure the compost blanket is not suspended in the air across the rill.
- b. Phil J. will measure and describe the ~1% coverage of plants currently on the site
- c. All mature spotted knapweed plants will be pulled. Any cheat grass on the site will be left alone.

Item 12: Phil J. will develop a seed mix using native species appropriate for the site. The site is glacial till primarily composed of fine sands and silts, with little clay. Species for the drier, harsher, south-facing slope will be preferred.

Item 13: The application of ground juniper as a vegetative cover was removed from the project.

Item 14: Safety issues were discussed. The ditch below the slope will leave adequate space for field work to occur off the road surface. However, Phil J. will contact the local MDT office to assure that signs will be placed on both sides of project to warn oncoming traffic.

Item 15: BMPs were discussed. Although the reestablishment of plants is a BMP, there was concern that the public may perceive the work to be adding sediment to the ditch below the cut slopes. It was resolved that Phil J. would locate some straw logs and place them on the down slope end of the project in the ditches on both sides of the road.

ACTION ITEMS:

1. Rob A. will pursue expediting the MDT contract with the MSU Office of Sponsored Programs and get the subcontract with RRG in place at the same time. RRG will then be able to finalize a contract with Quality, pointing out the changes to the plot construction that were decided at this meeting (no gravel application, an additional tackifier application).
2. The selection of the two tackifiers will occur between Stuart J., Phil J., and Quality
3. Phil J. will make the final decision on the seeding mixture and give information to WTI so it is in the report.
4. Rob A. will notify the Technical Panel when the work dates are finalized with Quality.
5. MDT, WTI, RRG, and others at the work site will pull weeds and hand rake rills as needed on the first day.
6. Phil J. will inventory plant coverage.
7. Phil J. will communicate safety needs so signs are placed by MDT for the week of plot construction.
8. Phil J. will bring and place straw logs in the ditches at the work site.
9. Rob A. will take Patrick P.'s edits for the Revised Proposal and incorporate the changes from the kickoff meeting into a Revised Proposal, version 2.